

Effects of Interior Plants on People's Well-being, Productivity and Pain Response

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Introduction

Plants are prominent and essential components of our lives (Lohr, 2003). We use plants, of course, for food and fiber. In the US, we also use them to decorate our homes, both inside and out. We use them to mark special occasions, such as weddings and funerals. We present them to people to comfort the sick.

Research has shown that plants provide a wide range of benefits (summaries are available in : Lohr, 2000 ; Pearson-Mims and Lohr, 2000 ; Relf and Lohr, 2003). Social interactions among people are improved (Kuo et al., 1998). Recovery from illness is faster (Ulrich, 1984). Mental fatigue is reduced (Tennessen and Cimprich, 1995). Even violence is reduced (Kuo and Sullivan, 2001). In my lab, we have been exploring some of these impacts of plants on people. We have shown that relative humidity indoors can be raised from levels that are too low for human health and comfort to levels within the acceptable range (Lohr, 1992). Another study documented that plants can reduce levels of dust indoors (Lohr and Pearson-Mims, 1996). We have shown that childhood interactions with plants promote positive adult attitudes towards plants, and that trees with spreading canopies and healthy green colors are particularly calming (Kaufman and Lohr, n.d. ; Lohr, 2004 ; Lohr and Pearson-Mims, 1997 ; Lohr and Pearson-Mims, 2004). Other studies, which I summarize below, have documented that the presence of interior plants can enhance well-being, improve productivity, and reduce pain (Lohr and Pearson-Mims, n.d. ; Lohr and Pearson-Mims, 2000 ; Lohr et al., 1996).

Research Studies

Well-being : Stress reduction

A number of studies have shown that people recover from stress more quickly when viewing slides or videotapes of nature than when viewing urban scenes (Parsons et al., 1998 ; Ulrich and Simons, 1986). Physiological

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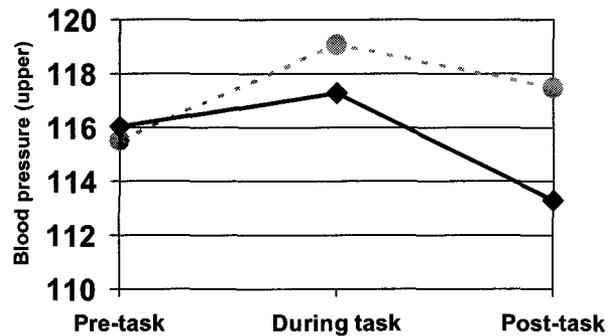


Fig. 1. Systolic blood pressure before, during, and after completing a computer-based recognition task in the presence (solid line) or absence (dotted line) of plants. Lines are significantly different at $p < 0.10$.

changes related to recovery from stress include lower blood pressure, higher alpha brain wave amplitudes, and reduced muscle tension when viewing scenes of nature compared to urban scenes (Ulrich and Simons, 1986).

In my lab, we showed that the same responses happen when people are in a room with a few containerized interior plants, even when their attention is not drawn to the plants, but to a computer and a productivity task (Lohr et al., 1996). We asked people to participate in a study measuring how people respond when performing a computer task. Participants were randomly assigned to perform the task when no plants were present in the room or when plants were present and positioned so the plants would be within the peripheral vision of the participant.

While performing the computer task, participants' systolic blood pressure rose, indicating that the task was stressful (Fig. 1). For those tested in the presence of plants, the rise was not as great, and it returned to pre-task levels more quickly than for those tested when no plants were present. This documented that the mere presence of interior plants could produce a calming response.

Well-being : Mental attention

In this same study (Lohr et al., 1996), people reported feeling moderate levels of positive emotions, such as feeling carefree or happy. They reported low levels of negative emotions, including anger and fear. After completing the productivity task, there were significant differ-

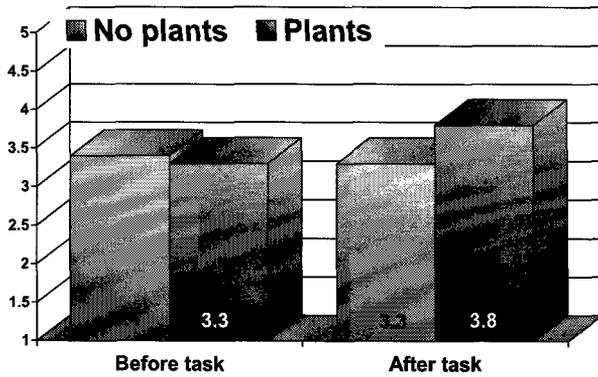


Fig. 2. Response to the statement "I feel attentive or concentrating," based on a scale from 1 (not at all) to 5 (very much), before and after completing a computer-based recognition task in the presence (dark bar) or absence (light bar) of plants. Treatment bars with different letters are significantly different at $p < 0.05$.

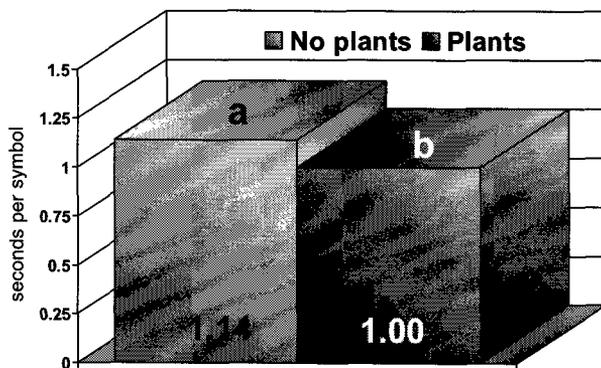


Fig. 3. Productivity measured as the number of seconds between seeing a symbol on a computer screen and hitting a key associated with that symbol (average of 50 symbols) in the presence (dark bar) or absence (light bar) of plants. Treatments are significantly different at $p < 0.05$.

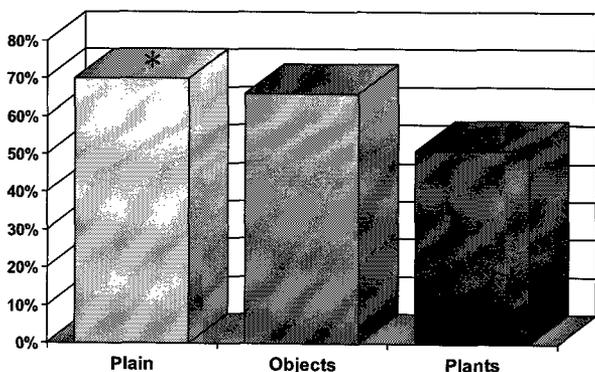


Fig. 4. Percent of subjects not tolerating the discomfort of holding a hand in ice water for five min in a plain room (light bar) or in a room with colorful objects (medium bar) compared to those in a room with plants (dark bar). Treatments are significantly different from plants treatment at $p < 0.10$.

ences on the item "I feel attentive or concentrating" (Fig. 2). After completing the computer task, people in the presence of plants reported feeling more attentive than those in the absence of plants. This is noteworthy, because attentiveness is an important attribute for employees in most jobs.

Productivity

The computer task used to measure productivity in this study involved visual concentration, mental processing, and manual dexterity. Specifically, reaction time to respond to each of 50 symbols by pressing an associated computer key was automatically recorded. People responded significantly more quickly when plants were in the room than when the plants were absent (Fig. 3). Reaction time in the presence of plants was 12% faster than in the absence of plants, indicating that plants contributed to increased productivity.

Pain response

Other researchers have examined the effects of plants on people with specific health problems and physical symptoms. For example, Ulrich (1984) showed that people recovered more quickly from surgery if they had a view from their hospital room of trees rather than a wall. In another study, Fjeld (2000) found that workers in an office with foliage plants reported fewer physical symptoms, including coughing, hoarse throat, and fatigue, than when no plants were present.

In my lab, we showed that pain tolerance is increased in the presence of plants (Lohr and Pearson-Mims, 2000). Subjects were tested in a room with one of three treatments: control, added colorful objects, or added plants. This enabled us to see if plants were simply a distraction to help keep one's mind off of the discomfort. To determine people's perceptions of the treatment rooms, we conducted an assessment with 17 statements. The room with plants was reported to be significantly more interesting, comfortable, and ornate, for example, than the plain control room, but the room with plants was not significantly more interesting, colorful, or attractive than the room with colorful, non-plant objects (Table 1). Thus, both the plants and the non-plant objects rooms were similar in their potential to provide visual distractions to help one concentrate on something other than discomfort. While those rooms were visually similar, the plants and the non-plant objects treatments were significantly different in other ways; for example, the room with plants had fresher air, was more pleasant, and more inviting.

The subjects in this experiment were asked to place a

Table 1. Selected perceptions² of the experimental room with no decorative objects present (plain control) or with non-plant decorative objects compared to subjects' assessments with plants present.

Room characteristic	Plain control	Non-plant objects control	Plants
boring interesting	2.49*	3.13 ^{NS}	2.94
stale air fresh air	2.97*	2.90*	3.26
drab or dull colorful	1.72*	2.82 ^{NS}	2.81
unpleasant pleasant	3.07*	3.23*	3.54
ugly attractive	2.30*	2.71 ^{NS}	2.83
uncomfortable comfortable	3.18*	3.56 ^{NS}	3.58
uninviting inviting	2.37*	2.87*	3.19
plain ornate	1.54*	2.18 ^{NS}	2.16

² Means are based on a scale of 1-5, with 1 most associated with the first term in the pair and 5 most associated with the second term in the pair.

*,^{NS} Score is different or not significantly different, respectively, from score with plants at P # 0.05.

hand in water at body temperature, and then into ice water. They were told they could remove their hand at any time. The percent of people who tolerated the discomfort of the ice water by leaving their hand in for five min (the time at which their hand would be numb) was recorded. Perceptions of physical discomfort were lower in the room with plants than in the control room without plants (Fig. 4). Perceptions of discomfort were also lower when plants were present than when the other decorative non-plant objects were present. This demonstrated that the positive benefits of plants are not simply associated with their decorative value, because decorative objects were not as effective in influencing pain tolerance.

Conclusion

Many research studies have begun to document beneficial effects of plants on people. Most of these studies have focused on plants outdoors or on scenes of nature. Our research and that of others have shown that interior plants in individual containers can also produce many benefits for people. This research confirms previous studies documenting the stress-reducing benefits of passively viewing plants. This research indicates that people's impressions of a room and their mental well-being can be significantly improved when plants are added. It also shows that productivity and mental functioning are improved and that pain perception can be reduced. It shows, in essence, that plants are essential for people to be at their best.

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